Text-to-Speech Pilot Project
Summary – June 2008

Background:

Reading is fundamental to academic success, high school graduation and positive transition to employment or post-secondary education. Unfortunately, many students with disabilities continue to have significant reading deficits when they enter high school despite the best efforts of special education intervention during their elementary years. These students frequently fall behind and become at risk for dropping out of school, failing to gather enough credits to graduate, or otherwise failing to successfully transition to employment or post-secondary education.

This is especially true for students with disabilities such as traumatic brain injury, autism, dyslexia and other disabilities that impact reading proficiency.

Special education remediation has been the traditional intervention used to address reading deficits in high school students with disabilities. However, many students with disabilities have realized maximum benefit from remediation by the time they reach high school. Other interventions include providing specific academic supports and enhancing study skills. Even these techniques are frequently ineffective in making students independent, successful learners. These students continue to struggle with academic content, reinforcing a sense of failure, and become less engaged and motivated at school.

Rarely is reading compensation through text-to-speech software (TtS) considered as a viable intervention for these students. This technology allows print information from textbooks, worksheets, tests or notes to be scanned or obtained in digital format then "read aloud" by a speech synthesizer which allows students to work free of human assistance (no more "oral reading" accommodations). The speech output shifts the skill demand to listening comprehension (receptive language) and the student is able to focus on academic content rather than struggling with reading decoding, fluency, or comprehension problems. The software is customizable to match the needs of each student. Highlighting of text helps visual tracking, word prediction supports written expression, and the built-in dictionary, thesaurus and other multi-modal tools are accessible within TtS software.

The use of accessible instructional materials and TtS software as a compensatory strategy for secondary students with reading deficits is well supported in the research literature. Dr. Marshall Raskind provides an excellent overview of that research base in an article entitled *Research Trends : Reading Machines for Students with LD*, Great Schools Inc., 2008, found at http://www.schwablearning.org/articles.aspx?r=984. In spite of the supportive research, use of TtS technology is infrequently utilized as a strategy to improve academic achievement and persistence to high school completion.

Pilot Project

In 2006-07, Missouri Assistive Technology initiated a pilot project to evaluate the impact of utilizing accessible instructional materials (AIM) and TtS technology on the graduation and transition outcomes of high school students with learning disabilities. Presuming positive transition outcomes, secondary objectives were to identify --

> ⁑ barriers to AIM and TtS usage and mechanisms to resolve those barriers, and

! student characteristics that were predictive of success in using AIM and TtS.

The pilot project was conducted in collaboration with five public school districts and data was collected on twenty students. Each student was outfitted with a laptop or tablet computer with (TtS) software and received related training and supports their junior year of high school. Students had accessible instructional materials and utilized the TtS technology throughout their academic schedule during their junior and senior years, especially in classes with significant reading and writing demands. By the end of their senior year all twenty participants had a successful transition outcome to either employment or post-secondary education. For many of the students, access to accessible materials and reading compensation technology not only made graduation a reality, but also improved achievement and expanded opportunities to skilled jobs and post-secondary education that were previously unattainable.

Students Characteristics
All twenty of the pilot project students were eligible for special education services as a student with a learning disability. Each had significant reading deficits that put them at-risk for not completing high school, graduating late from high school, and/or underachieving academically. All had relatively average oral language skills and poor reading proficiency (most with standard scores of less than 90 and many with standard scores of 79 or less.)

District staff selected students for participation who were perceived as having post-secondary or employment potential – but who were not going to realize that potential primarily due to reading deficits. These were students who typically had "oral reading" accommodations included in their IEPs and most relied on teachers, parents, peers and/or paraprofessionals for reading support.

Each student completed a pre-intervention inventory that asked about technology usage, perceived impact of that usage on reading and writing, and perceived need for reading and writing support services. The students varied dramatically in their prior use of and comfort level with technology. Some were very experienced technology users and others were complete novices. Overall, these students did not perceive (or were not willing to admit) very significant needs for reading and writing support. None indicated they needed more than a moderate level of help in these areas.

Student Outcomes
Utilizing the performance measures required of all states by the IDEA State Performance Plan (SPP) the following outcomes were realized for these twenty students.

  ! 95% graduated on time (one completed a trade program)
  ! 85% improved academic achievement (evidenced through improved grades)
  ! 55% increased time in regular education and decreased time in special education
  ! 95% decreased reliance on human assistance
  ! 55% increased parent satisfaction (evidenced by unsolicited positive parental contact)

All twenty students had a successful transition outcome with 75% being accepted to a post-secondary educational program and the other 25% transitioning to gainful employment such as medical transcription.

Adoption/Expansion Barriers
A focus group of school staff instrumental in the pilot implementation met in December of 2007 after the pilot had been underway for over 12 months. Through facilitated discussion, they

identified what they perceived to be the two overarching barriers to widespread adoption of TtS compensation technology.

> ! Continued reluctance on the part of educational staff to compensate for reading deficits. In general, educators want to "fix" the deficit rather than compensate for it. Some staff also view compensatory technology as an "unfair advantage".

> ! Anxiety on the part of administrators about the scope of students who will benefit. Many are fearful of a "flood" of requests for computers and software by all special education students. Providing such equipment would obviously have overwhelming costs and the staff time required to address such requests would drain resources. Schools also have concerns about the expertise necessary to provide supports for such technology on a broad scale and those associated costs.

To address the reluctance of educators to embrace compensatory strategies, the pilot project developed a DVD to be used with educational staff to foster understanding and acceptance of TtS technology as an appropriate and effective intervention (available online at Http://winmedia.umsl.edu/msba/MAT_TTA_Video_CBR.wmv). This DVD was done in one district and a second has collected video footage. Work remains to be done to add information about the positive outcomes and discussion to mitigate concerns about an "unfair advantage". The desired end product is a DVD that addresses these concerns that can be used by any district to support acceptance.

To address the second barrier, a preliminary analysis of student characteristics was done to begin identification of factors predictive of positive outcomes. Data analysis negated some initial hypotheses. Specifically, there was no correlation between prior use of and expertise with technology and degree of success in this pilot. While informal reports do indicate students who were motivated to learn about and willing to use the technology had more positive outcomes the data collected as part of the pre-intervention inventory was not a useful predictor of positive outcomes.

Another potential predictive factor investigated was the gap between a students' oral and written language proficiency. It was hypothesized that the greater the gap the more likely the student would see significant positive impact in using accessible instructional materials with compensatory technology. This was not the case for these students as no correlation was found.

The one strong predictive factor identified was the level of reading deficit -- the more significant the reading deficit the more positive the impact on academic performance (-.7 correlation). This appears to be the single greatest predictive factor for positive outcomes and is consistent with previous research findings. Clearly with an N of 20, this finding is preliminary at best, but seems promising in addressing administrator concerns.

Future Needs

There is a need to corroborate findings of the pilot through replication with other students in additional districts and to develop materials that would support such expansion. Specific questions to be answered in an expansion/replication would include:

Can the positive findings be matched when a larger, more varied population of students have accessible materials and use TtS technology to compensate for reading deficits?

 Does beginning earlier in the secondary years have a positive impact on outcomes?

 What materials and supports are needed to garner support and effectively implement in a new building?

Targeted Expansion Students
During focus group discussion, the pilot districts agreed that providing accessible materials and TtS technology for students with disabilities other than learning disabilities and providing such earlier in high school would yield greater student benefit. As a result the following are general selection criteria that would be suggested for participation in a replication project:

 Formal diagnosis of disability and individualized education program (IEP) documented in school records

 Priority given to including freshmen, sophomores and juniors for comparative purposes

 General cognitive ability within the average range sufficient to support high school graduation

 Communication Arts, Reading and Written Expression achievement scores are significantly below age and grade level expectations. A link between underachievement in academic areas and limited reading/writing proficiency is present.

 IEP indicates a need for accommodations and/or includes goals to address reading deficits.

 Generalized perception of "at risk" for dropping out of high school, not persisting to high school completion, or failing to accumulate sufficient credits to graduate in a timely manner.

Students should be representative of the economic, racial and ethnic composition of participating districts and those districts should include both urban and rural schools.

Expansion Implementation Issues
An expansion effort will require technology coordinators in each district to be provided with training to become familiar with TtS software and related hardware. District liability and policy concerns regarding student use of scanners, remote log-in to district servers and allowable use of internet will also need to be addressed prior to student usage of systems on full-time basis. Finally, orientation to obtaining accessible instructional materials, use of TtS software and relevant hardware and software training will need to be provided to staff that will frequently interface with participating students. Standardized training materials that have been developed as part of the pilot project could be expanded to meet these needs.

For student training, a formal, ten-week curriculum was developed and tested during the pilot, and could be expanded and refined for an expansion. The training introduces the features of the TtS software to the students and helps each student understand how to incorporate the

features of the software to their daily academic tasks. At the conclusion of training, full-time use of TtS throughout each school day can transpire. Students should have access to additional training and system maintenance as needed.

Project Measurements/Outcomes
For any expansion effort, baseline information would need to be collected prior to intervention and would include the following:

Data Element	Measurement
Academic Achievement	Prior statewide achievement test proficiency levels (MAP)
	Previous year grades for core academic classes
Perceived Educational Competence	Self and Teacher rating (self-confidence, competence)
Technology Expertise/Experience	Self and Teacher rating
Oral and Written Language Level	Standard scores from individual standardized tests
Attendance	Ratio of days attended to total days of school for year
Time in Special Education	Minutes per week in special education from IEP
Amount of Human Assistance	Rating scale, identification of IEP accommodations
Parent Satisfaction	Rating scale, count of unsolicited positive contacts
Current Transition Goal	Identified from list

Attendance and grade reports should be collected regularly along with anecdotal information about technology usage/benefit and any parent comments reflective of satisfaction. Annually, standardized academic achievement data should be collected and self-perception inventories should be administered to document change and benefit. Assuming a multi-year project, accumulation of credits should be documented annually along with progression to graduation. With each IEP review/revision (at least annually) the amount of time in special education should be gathered along with the level of human assistance that is provided to evaluate for positive changes in special education services needed and level of independence achieved. When a student completes their high school program, information should be collected on their transition outcomes (to employment, to post-secondary, etc.)